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Abstract #260

Section: Ruminant Nutrition
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260

Are EPA, DPA, and DHA equally effective to modulate ruminal biohydrogenation in cows? A comparative in vitro study.

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Marine lipid supplements are rich in very long chain n-3 polyunsaturated fatty acids (PUFA) that inhibit the ruminal saturation of *trans*-11 18:1 and, consequently, may enhance the concentration of *cis*-9,*trans*-11 conjugated linoleic acid (CLA) in milk and meat. In this regard, docosahexaenoic acid (DHA, 22:6n-3) has been suggested to increase total *trans*-18:1 accumulation in the rumen to a greater extent than eicosapentaenoic acid (EPA, 20:5n-3), but information about changes in individual 18:1 isomers is very limited. Furthermore, although EPA and DHA are accepted to be the main responsible for this modulatory effect on ruminal biohydrogenation (BH), the contribution of docosapentaenoic acid (DPA, 22:5n-3), the third most abundant n-3 PUFA in marine lipids, remains unknown. The aim of this study was to compare the impact of EPA, DPA and DHA on the BH of dietary C18 fatty acids, using batch cultures of rumen microorganisms and cannulated cows as inocula donors. The 3 PUFA were added at a dose of 2% of incubated substrate (the TMR fed to the animals; 50:50 forage

concentrate ratio) and effects were examined after 24 h of incubation. Data were subjected to ANOVA using the MIXED procedure of SAS 9.4. Overall, EPA and DHA were equally effective to increase the concentration of *trans*-11 18:1 (on average, +79% compared with the control; $P < 0.001$), suggesting that supplements containing differing EPA/DHA ratios (e.g., fish oils or marine algae) would have comparable effects at the same PUFA level. However, DHA further promoted alternative BH pathways that lead to *trans*-10 18:1 accumulation (+205% relative to the control; $P < 0.01$). The saturation of *cis*-18:1 and non-conjugated 18:2 isomers was also constrained, particularly by DHA in the former case and by EPA in the latter. Increases in *trans*-11 *cis*-15 + *trans*-10,*cis*-15 18:2 and in *trans*-9,*trans*-14 18:2 ($P < 0.001$) may indicate that EPA had specific effects on 18:3n-3 metabolism. Only minor variations in ruminal BH intermediates were observed in response to DPA (e.g., increments in *trans*-10,*trans*-13 and *cis*-15 18:1; $P < 0.05$), which suggests a low contribution of this PUFA to the action of marine lipids.

Key Words: rumen, lipid metabolism, *trans* fatty acid